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Neuropsychological Functioning In Social Phobia

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NEUROPSYCHOLOGICAL FUNCTIONING IN SOCIAL PHOBIA

by

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ABSTRACT

The purpose of the current study was to clarify the neurocognitive mechanisms underlying social phobia. Previous research has identified some specific group differences in neurocognitive functioning between individuals diagnosed with social phobia and nonpsychiatric controls, but has failed to administer a comprehensive neuropsychological battery to a social phobia patient group, resulting in a piecemeal understanding of the neurocognitive functioning of this population and an incomplete picture of the neuropsychological profile inherent to this group. The present research utilized a broader collection of neuropsychological tests to assess nine cognitive domains: Verbal Learning, Verbal Delayed Memory, Visual Immediate Memory, Visual Delayed Memory, Visual-Spatial Processing, Verbal Working Memory, Visual Working Memory, Executive Functioning, and Attention. A mixed analysis of variance (ANOVA) did not reveal a significant group by cognitive domain interaction, nor a significant main effect of group. As this was the first study to examine multiple cognitive domains in a single sample of individuals with generalized social phobia, exploratory univariate analyses were performed to examine group differences for the specific cognitive domains. This revealed significant group differences specific to the Visual Working Memory domain, with the social phobia group scoring significantly lower than the nonpsychiatric control group. Implications of these findings and directions for future research are discussed.

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LIST OF ACRONYMS/ABBREVIATIONS

ADIS-IV	Anxiety Disorders Interview Schedule for DSM-IV
CVLT	California Verbal Learning Test
SPAI	Social Phobia and Anxiety Inventory
STAI	State-Trait Anxiety Inventory
TMT	Trail-Making Test
WAIS	Wechsler Adult Intelligence Test
WMS	Wechsler Memory Scale

INTRODUCTION

Social phobia is a psychiatric disorder marked by persistent fears of social or performance situations in which embarrassment or negative evaluation by others may occur (American Psychiatric Association, 2000). These situations are often avoided, which leads to disability in social, educational, and occupational functioning. Social phobia is a chronic, usually lifelong, condition if not adequately treated. It typically begins in early adolescence, often emerging out of a pattern of shyness in earlier childhood. It is about twice as common in females and affects somewhere between 4% to 8% of the population, making it one of the most common psychiatric disorders (Kessler, 2003). Twin studies have established an underlying genetic component to this disorder (Kendler, Neale, Kessler, Heath, & Eaves, 1992). In addition, neuroimaging research has pointed to volumetric and functional brain differences related to social phobia. A number of studies have suggested a "highly sensitive fear network centered in the amygdaloid-hippocampal region and encompassing the prefrontal cortex" in individuals with social phobia (Tillfors, 2004, p. 273). In particular, significant differences in amygdala activation in social phobia has been well supported in the literature (e.g., Hermans & Honk, 2006; Straube, Mentzel, & Miltner, 2005; Veit et al., 2002). Amir et al. (2005) reported a significant increase in activity in the anterior cingulate cortex when individuals with social phobia viewed socially-threatening material, as compared with non-anxious controls.

Current empirically-supported treatments for social phobia include both psychotherapy and medications. The treatment of social phobia has seen rapid advancement in recent years, and current estimates suggest that roughly 50% to 70% of individuals seeking treatment for social phobia are classified as treatment responders (Jørstad-Stein & Heimberg, 2009; Acarturk, Cuijpers, van Straten, & de Graaf, 2009). There remains, however, a minority of individuals who

experience only a partial reduction of their symptoms after treatment is discontinued. Moreover, a recent replication of the National Comorbidity Survey suggests that when social phobia cases are considered as a whole (i.e., both treated and untreated cases), full recovery may be a long process (Ruscio et al., 2008). Specifically, these authors reported that 20%-40% recover within twenty years of onset and 40%-60% recover within forty years of onset, when recovery is defined as greater than two years free of symptoms (Ruscio et al., 2008). These estimates may be somewhat inflated due to the fact that within the same sample only 35.2% of these cases reported ever receiving treatment specifically for social phobia, and that the number of social fears was inversely related to treatment-seeking among non-comorbid social phobia cases (Ruscio et al., 2008). This does highlight a potentially important role for prevention approaches, however, as even the most efficacious treatments for social phobia cannot be implemented if these individuals are not presenting for treatment. Therefore, there is a need for research that clarifies the underlying mechanisms and etiology of this disorder, which can potentially inform new treatment and prevention components that seek to address these issues.

Neuropsychological evaluation is a method of inferring the functioning of particular brain networks without the need for expensive and invasive neuroimaging techniques. This approach uses paper-and-pencil and computer-based measures that have been previously established to correlate with functioning in particular brain regions. Neuropsychological research has been successfully used to elucidate neurobiological mechanisms involved with other psychiatric disorders over the past several decades, most notably with schizophrenia. These findings, in turn, have been translated into cognitive rehabilitation and remediation techniques that have proven to be effective components in the treatment of the disorder (see Cavallaro et al., 2009 for review). When considering anxiety disorders, recent studies have attempted to apply similar techniques to

determine neurocognitive profiles for specific disorders that can later be translated into treatment. For example, Amir, Beard, Burns, and Bomyea (2009) reported implementing a treatment paradigm that targeted the attention bias for threat-relevant information that is generally exhibited by individuals with generalized anxiety disorder. The results of their study suggested that these attention mechanisms contributed to the maintenance of GAD, and that interventions seeking to alter these processes may be effective in reducing anxiety symptoms in this population (Amir, Beard, Burns, & Bomyea, 2009). While research of this kind is still in the initial stages, it seems worthwhile to investigate whether underlying neurocognitive profiles of other specific disorders can be identified and targeted directly in an effort to bolster current treatment and prevention strategies. Unfortunately, these techniques have only rarely been used to further our understanding of social phobia.

Although relatively little research to date has investigated the neuropsychological profiles of individuals with social phobia, there have been a few notable studies. Asmundson, Stein, Larsen, and Walker (1994) were among the first to publish neuropsychological findings for a group of patients diagnosed with social phobia. This group administered four subtests of the Wechsler Adult Intelligence Scale – Revised (WAIS-R; Vocabulary, Similarities, Block Design, and Picture Completion subtests) as well as the California Verbal Learning Test, the Benton Visual Retention Task – Form F, the Trail-Making Test, and the Digit Cancellation Test to panic disorder patients, social phobia patients, and nonpsychiatric controls. Asmundson et al. (1994) designed the battery to assess "verbal learning and memory, visual memory, psychomotor speed, cognitive flexibility, and concentration" (201). They found that both panic disorder and social phobia patients exhibited diminished performance on total recall for CVLT (Trials 1 through 5 combined), but only the social phobia patients displayed deficits in the initial learning of the

verbal information when this component was examined separately (Trial 1). A non-significant trend of reduced accuracy on the concentration task (Digit Cancellation Test) was also noted for social phobia patients. In addition, both social phobia and panic disorder patients were noted to perform at a significantly lower level than nonpsychiatric controls on the Block Design subtest. No statistically significant differences were found between the three groups for visual memory, psychomotor speed, cognitive flexibility, or concentration in this sample. Their results suggested statistically significant decreased performance for both anxiety groups on particular neuropsychological measures, and a specific decrement in performance for social phobia patients on a task requiring free recall of verbal stimuli after a single presentation.

Cohen et al. (1996) also examined neuropsychological functioning in social phobia patients, and compared this group with both obsessive-compulsive disorder (OCD) patients and nonpsychiatric controls. These researchers assessed visuoconstructional functioning with the WAIS-R Block Design subtest, and visual memory with the Benton Visual Retention Test and the Matching Familiar Figures Test. The Matching Familiar Figures Test was also used as a measure of executive functioning (e.g., decision making and planning abilities), as was the Trail-Making Test. The WAIS-R Digit Span subtest was administered to measure attention and memory, and the Digit Symbol subtest was administered as a nonspecific measure of functioning. Cohen et al. (1996) found that OCD patients showed significant impairment on the Digit Symbol subtest and the Benton Visual Retention Test. The social phobia patients performed significantly worse than controls on measures of visuoconstruction abilities (Block Design), visual memory (Benton Visual Retention Test), and a measure of visuospatial processing speed and executive functioning (Trails A and Trails B, respectively). Furthermore, social phobia patients displayed deficits in executive functioning (Trails B), even compared to

the OCD group. No other significant differences between the OCD and social phobia patient groups emerged, and there were no significant differences between any of the three groups on the Matching Familiar Figures Test or the Digit Span subtest. The authors concluded that different neuropsychological dysfunctions may be implicated in different anxiety disorders.

A slightly different approach was taken by Hollander et al. (1996) when they examined neurological 'soft signs.' Neurological soft signs refer to abnormal performance on motor and sensory tasks that cannot be localized to a specific brain region. This study compared social phobia patients to nonpsychiatric controls across four domains: fine motor coordination, involuntary movements, sensory function, and a visuospatial (cube drawing) task (Hollander et al., 1996). The authors reported that social phobia patients had a greater number of neurological soft signs in the domains of fine motor coordination, involuntary movements, and visuospatial impairment – suggesting brain dysfunction related to social phobia.

In a 2004 study, Sachs et al. administered a brief, computerized neuropsychological battery as part of a larger event-related potential (ERP) study. This research group used the Wisconsin Card Sorting Test, the d2-cancellation test, the Verbal Learning Test and the Non-Verbal Learning Test. These four tests were given to patients diagnosed with social phobia, and the results were compared with the performance of each test's published non-clinical normative sample. Sachs et al. (2004) found that the only significant differences in performance were found on the d2-cancellation test, which reflected decreased accuracy in focal attention and short-term concentration for the social phobia group. Executive functioning, verbal learning, and nonverbal learning appeared intact in this particular sample.

Airaksinen, Larsson, and Forsell (2005) administered a 32-item, neutral word list to assess episodic memory, the Word Association Test to measure verbal fluency, and the Trail-

Making Test to examine visuospatial processing speed and executive functioning. Several anxiety disorders were compared to a nonpsychiatric control group, including social phobia, panic disorder, generalized anxiety disorder, obsessive-compulsive disorder, and specific phobia. Deficits in episodic memory were found in the panic disorder, obsessive-compulsive disorder, and social phobia groups. Social phobia patients also showed a non-significant trend toward generating fewer words in the verbal fluency task. There were no statistically significant differences in performance among the six groups for Trails A (reflecting visuospatial processing speed). Only the panic disorder and obsessive-compulsive disorder groups showed significantly slower performance on the Trail-Making subtest that also included an executive functioning component (Trails B), as compared to the nonpsychiatric control group.

More recently, Graver and White (2007) administered the Wechsler Adult Intelligence Scale – Third Edition (WAIS-III) Digit Span subtest, Wechsler Memory Scale – Third Edition (WMS-III) Spatial Span subtest, the Trail-Making Test, and the Wisconsin Card Sorting Test (WCST) to a social phobia group, a comorbid social phobia and depression group, and a nonpsychiatric control group. Graver and White's test battery was designed to cover verbal attention, working memory, spatial memory, set shifting, and executive function. A unique aspect of the Graver and White (2007) study is the inclusion of a stress-induction condition. Each participant was administered the neuropsychological test battery twice: once under a baseline condition, and a second time under a stress-induction condition. In this study, stress was induced by informing participants that they were being videotaped for a training video intended for mass distribution, and that a red light on the recording equipment would signify when recording may take place. These researchers found no statistically significant differences among groups in the baseline condition. Under the stress condition, however, group differences began to emerge. The

social phobia patients showed less improvement on set-shifting and working memory tasks than the control and comorbid group during the stress (compared to baseline) condition (Trails B, Digit Span). The social phobia group also demonstrated a reduction in complex problem solving and spatial attention performance as compared to other groups after stress induction (WCST, Spatial Span).

Taken together, the previous research on neuropsychological functioning related to social phobia reveals both similar and discrepant findings. All studies examining the domain of visual-spatial processing reported decreased performance in individuals with social phobia, as evidenced by scores on Block Design (Asmundson et al., 1994; Cohen et al., 1996) and a cube drawing test (Hollander et al., 1996). Dysfunction in the verbal memory domain was suggested by Asmundson et al. (1994) and Airaksinen, Larsson, and Forsell (2005), although in both studies it appears that this dysfunction is not specific to social phobia, as it was also found in other anxiety disorders. Sachs et al. (2004) reported no significant differences for social phobia patients on the Verbal Learning Test, but it should be noted that this test differs from the verbal memory tasks used in the other studies because it involves recognition of meaningless words printed on cards as opposed to recall of actual words (Lakerveld, Kotchoubey, & Kübler, 2008). The Verbal Learning Test used in Sachs et al. (2004) should therefore be considered a measure of learning abilities free from context and not necessarily immediate verbal memory.

In the domain of executive functioning, performance on both the Trail-Making Test (Trail B) and the Wisconsin Card Sorting Test has been examined. On the Trail-Making Test (Trail B), Asmundson et al. (1994), Airaksinen et al. (2005), and Graver and White (2007) found no significant differences in completion time for individuals with social phobia as compared to controls in baseline conditions. Cohen et al. (1996), however, reported that social phobia patients

had significantly longer completion times on this test. On the Wisconsin Card Sorting Test, Sachs et al. (2004), as well as Graver and White (2007), reported no significant differences for social phobia patients under baseline conditions.

Mixed findings have also been present in the attention domain. Sachs et al. (2004) reported a statistically significant decrease in accuracy on the digit cancellation test for social phobia patients, and Asmundson et al. (1994) reported a non-significant trend toward reduced accuracy on a similar test. Both Cohen et al. (1996) and Graver and White (2007) found no significant differences in performance on the digit span forward subtest, however. The domains of verbal working memory and visual working memory appear to have been examined less often than other domains of neuropsychological functioning. Verbal working memory does not seem to have been fully addressed by previous research, and only one of the studies above administered a task related to the visual working memory domain. Graver and White (2007) reported no group differences on a visual working memory task (Spatial Span) in the baseline condition.

As the existing literature on neuropsychological performance in individuals with social phobia is sparse and inconsistent, there is a need for research that clarifies the neuropsychological profile related to this disorder. None of the existing studies used a neuropsychological battery that examined a wide range of cognitive areas, which limits interpretation of the inconsistent results. While there was some overlap of cognitive areas examined (e.g., verbal memory, visual-spatial processing), the particular measures that were used typically varied as well. Research that uses a comprehensive neuropsychological battery in a single sample of individuals with social phobia is needed to clarify these previous reports. Before any of these findings can be translated into potential targets for treatment and prevention efforts,

the neurocognitive mechanisms underlying social phobia must be fully examined to determine whether a distinct neuropsychological profile for the disorder exists, and if so, where the deficits lie. This study aims to build upon these past findings and refine our understanding of the underlying mechanisms of social phobia. The current study will administer a neuropsychological test battery to a sample of individuals who meet DSM-IV diagnostic criteria for generalized social phobia and a sample of nonpsychiatric controls. The neuropsychological battery will examine the domains of verbal and visual memory, visual-spatial processing, verbal and visual working memory, executive functioning, and attention.

Based on the limited published findings regarding the neuropsychological functioning of social phobia patients, we hypothesize that the social phobia participants will show a statistically significant reduction in performance, compared to nonpsychiatric controls, in the domains of verbal learning and visual-spatial processing. This is based on the few areas of overlap and potential agreement in the extant literature, which suggests a greater probability of true differences in performance between social phobia patients and nonpsychiatric controls in these particular cognitive domains.

METHOD

Participants

Previous research using tasks similar to those in the current study (described in detail below) have all reported relatively large effect sizes. Specifically, studies administering the Block Design subtest, Trail Making Test (Trails A and B), and California Verbal Learning Test (Trials 1-5) reported Cohen's *d* effect sizes ranging from 0.81 to 1.41. When using a similar effect size (*d* = .80) in a power analysis (G*Power software), with an alpha of .05, and power of .80, the estimated total sample size (both groups combined) was suggested as 42. Our combined sample size (social phobia group plus nonpsychiatric control group) was 50, which exceeds this suggested sample size and should provide sufficient power to find the quantitative group difference on these measures of interest.

This study recruited adult participants from the local community, with the goal of obtaining two groups: 25 individuals who meet criteria for generalized social phobia and 25 participants to serve as nonpsychiatric controls. Participants were recruited through use of advertisements in newspapers and websites, word of mouth from previous participants, and posted flyers in the community. Some of the advertisements targeted individuals who were likely to have social phobia, while others targeted nonpsychiatric control participants. We paid all participants $10 per half hour of participation as an incentive to travel to the university and participate in this research. The full assessment session typically lasted between 2 and 2.5 hours per participant.

We obtained verbal informed consent and conducted a brief phone screen on all individuals who responded to our advertisements. This served to screen out individuals who did not seem appropriate for the diagnostic categories, as well as individuals reporting a history of

neurological illness, traumatic brain injury, or other self-reported psychiatric illness or treatment (see Appendix D). All participants were at least 18 years of age and the upper age limit was set at 65. There were no restrictions based on gender, race, or ethnicity. We did, however, match the demographics of the control group to those of the social phobia group (see Table 1).

Participants passing the phone screen mentioned above were then invited to participate in a research session held in the Psychology Building on campus. If individuals recruited for the social phobia group did not meet diagnostic criteria based on our structured clinical interview (see Measures below), they were paid for their time but did not complete the cognitive testing. Individuals in the social phobia group with comorbid psychiatric diagnoses were excluded, with an allowance for comorbid specific phobia. Similarly, if individuals recruited for the nonpsychiatric control group met criteria for a current psychiatric illness (with an allowance for specific phobia) they did not complete cognitive testing. Throughout the course of the present study, a total of six individuals were discontinued for not meeting diagnostic criteria. In the current sample, two participants in the social phobia group (8% of the social phobia group) and one participant in the control group (4% of the control group) met criteria for a specific phobia. The only past diagnoses allowed in either group were adjustment disorder, substance abuse (with none in past month), specific phobia, and major depressive disorder in full remission. All participants in the current study had normal or corrected-to-normal vision, were free from significant hearing problems, and had English as their primary language. Participants reporting a history of significant head injury (loss of consciousness greater than 10 minutes), neurological illness (e.g., stroke, seizures, brain tumor, Parkinson's), or systematic medical diseases that may affect neurocognitive functioning (e.g., active AIDS, lupus, congestive heart disease, insulin-dependent diabetes) were excluded from the study. Participants in either group who were

currently prescribed benzodiazepines, tranquilizers, anti-psychotics, or narcotic pain medications were also excluded, as these medications have a strong potential to decrease cognitive performance. Participants prescribed other classes of psychotropic medication (e.g., anti-depressants, stimulants) were not excluded from either group. In the current sample, none of the participants in either group endorsed being prescribed psychotropic medication of any kind. Participants reporting significant alcohol consumption or any other substance use within the past 48 hours were excluded, as this may alter the results of cognitive testing.

Measures

The measures for this study were selected in order to diagnose psychopathology and create a comprehensive neuropsychological battery. Each of the neuropsychological measures fell under one of nine domains: Verbal Learning, Verbal Delayed Memory, Visual Immediate Memory, Visual Delayed Memory, Visual-Spatial Processing, Verbal Working Memory, Visual Working Memory, Executive Functioning, and Attention. Each measure is described in detail below, and the measures composing the neuropsychological battery each include the name of the domain that they fall under. Table 2 summarizes the measures which comprise each domain.

Anxiety Disorders Interview Schedule – IV (ADIS-IV).

The ADIS-IV (Brown, DiNardo, & Barlow, 1994) is a structured clinical interview that assesses for anxiety symptoms. This interview is aimed at providing differential diagnosis among the anxiety disorders according to DSM-IV criteria. Mood disorders, somatoform disorders, and substance use are also assessed by the ADIS-IV due to the high comorbidity of these issues with anxiety disorders. In addition, the ADIS-IV contains a screen for psychosis. A clinical severity rating (CSR) is assigned for each

diagnosis identified by the ADIS-IV, which ranges from zero (0; absent or no distress) to eight (8; very severely disturbing or disabling). According to the ADIS-IV Clinician Manual (Brown, DiNardo, & Barlow, 1994), severity ratings of four or above indicate that the individual's symptom presentation meets or exceeds DSM-IV diagnostic criteria. In the current study, the ADIS-IV was used to assess which participants met criteria for the social phobia group, and was used to exclude participants from both groups with disorders that may have served as confounds to the study (see Exclusion criteria above).

Social Phobia and Anxiety Inventory – 23 (SPAI-23).

The SPAI-23 (Roberson-Nay, Strong, Nay, Beidel, & Turner, 2007) is a 23-item self-report measure that assesses social phobia symptoms, and is an abbreviated version of the original 45-item SPAI (Turner, Beidel, & Dancu, 1996). Cognitive, behavioral, and somatic symptoms of social phobia across a variety of situations are assessed by the SPAI-23. This measure is comprised of two subscales: Social Phobia and Agoraphobia. The use of the Agoraphobia subscale is notable because this is subtracted from the Social Phobia subscale score in order to derive a difference score. The result is "a purer measure of social phobia" (p.2; Turner, Beidel, & Dancu, 1996). The authors cite excellent psychometric properties, including high internal consistency and discriminant validity, as well as high correlation with the original form of the SPAI. This measure was used in conjunction with the structured interview in order to estimate the severity of participants' social phobia symptoms.

State-Trait Anxiety Inventory (STAI).

The STAI (Spielberger et al., 1983) is a self-report measure that assesses both transient ('state') anxiety and more pervasive, characteristic ('trait') anxiety. The STAI

was used in the present study to assess each participant's current anxiety level during the assessment session, as well as self-reported trait anxiety level.

Wechsler Adult Intelligence – III (WAIS-III) Subtests (Wechsler, 1997a).

Block Design.

The Block Design subtest involves having participants physically manipulate and arrange blocks in order to match printed designs. This subtest emphasizes visuoconstruction abilities. As such, the total raw score on Block Design fell under the Visual-Spatial Processing domain.

Wechsler Memory Scale – III (WMS-III) Subtests (Wechsler, 1997b).

Family Pictures I & II.

The Family Pictures I & II subtests involves showing pictures to participants, and then examining both immediate (Family Pictures I) and delayed (Family Pictures II) recall of characters and activities shown in each scene. This study used the total raw score from Family Pictures I for the Visual Immediate Memory domain and the total raw score from Family Pictures II for the Visual Delayed Memory domain.

Word Lists I & II.

Word Lists I & II involve reading lists of words to participants, and then examining both immediate (Word Lists I) and delayed (Word Lists II) recall of the words. Word Lists II also has a recognition condition, which was not used for analysis. In the current study, the total immediate recall raw score from the Word Lists I subtest was used for the Verbal Learning score and the total delayed recall

raw score from the Word Lists II subtest was used for the Delayed Verbal Memory score.

Letter-Number Sequencing.

The Letter-Numbering Sequencing subtest involves listening to a list of a random letters and numbers, holding them in memory, manipulating them into a new order, and then stating the new sequence aloud. The Letter-Numbering Sequencing total raw score fell under the Verbal Working Memory domain in the present study.

Spatial Span.

The Spatial Span subtest requires participants to touch a series of three-dimensional blocks in a prescribed order (both forward and backward conditions), in increasingly long series. This task requires participants to retain and manipulate nonverbal information in their working memory, and as such the total raw score on this measure fell under the Visual Working Memory domain.

Digit Span (Forward).

The Digit Span (Forward) subtest asks participants to listen to a list a numbers and then immediately repeat them aloud in the order presented. This subtest is widely considered a measure of attention because it does not require participants to manipulate the information in any way. As such, the Digit Span (Forward) subtest raw score fell under the Attention domain in the present study.

Rey Complex Figure Test (Copy).

The copy condition of the Rey Complex Figure Test (Meyers & Meyers, 1996) presents participants with a complex geometric design, and requires them to precisely

draw the figure while it is directly in front of them. This test examines visuoconstructive abilities, and the total raw score was included in the Visual-Spatial Processing domain in the current study.

Trail-Making Test (TMT).

The TMT (Reitan & Wolfson, 1985) is split into two portions: A and B. In Trails A, individuals must draw lines connecting a set of consecutively numbered circles. Trails B is similar, but includes a set-shifting component that requires participants to alternate between numbers and letters. In both conditions, the score is based on the speed in which the participant completes the task. If the participant makes an error, the examiner requires that they stop and correct the error, which delays the completion time. In the present study, Trails A completion time was included under the Attention domain, and Trails B completion time fell under the Executive Functioning domain. The placement of Trails A and Trails B into these domains reflects the currently accepted clinical and research applications for the TMT (Heaton, Miller, Taylor, & Grant, 2004).

Stroop Task.

Several variations of the Stroop task exist. The current study employed a three condition (congruent, incongruent, and neutral) Stroop task with four color choices- red, green, blue, and yellow. During the neutral condition, a row of four "X's" appears in one of the four colors. The neutral condition serves as baseline measure of reaction time of simply responding to color, since there is no reading component and thus no interference during neutral trials. During the congruent condition, a color word appears in matching, or congruent font color (i.e. the word RED appears in red font). During the incongruent task, the color word and the actual color of the font is different (i.e. the word GREEN

written in red font). The incongruent trials require the participant to suppress the habitual reading response, thus creating interference. Since the participant must inhibit the automatic reaction of simply reading the word, the contrast score from this task (incongruent reaction time – congruent reaction time) was included in the Executive Functioning domain.

Procedures

After providing written informed consent, participants were administered the ADIS-IV to assess for anxiety symptoms and other psychopathology. All ADIS-IV interviews were conducted by the primary investigator, who was not blind to the screening process. After the diagnostic interview participants completed the SPAI-23 and STAI questionnaires. They were then administered the neuropsychological testing battery, consisting of the cognitive tasks listed above. The tasks were presented in a fixed order: Family Pictures I, Word Lists I, Letter-Number Sequencing, Spatial Span, Digit Span (Forward), Block Design, Trail-Making Test (A & B), Rey Complex Figure Test, Family Pictures II, Word Lists II, and the Stroop Task. At the end of the testing, participants were paid for their time and provided with a debriefing statement that discussed the purpose of the study. All participants were also provided with a list of treatment referral sources in the event that they wished to seek psychological services.

RESULTS

Clinical Interview Data

An estimate of diagnosis accuracy was obtained using a procedure modeled after Turner, Beidel, Long, and Greenhouse (1992). All ADIS-IV interviews were recorded as digital audio files and stripped of all personally identifying data. Thirteen of these files (6 from the nonpsychiatric control group and 7 from the social phobia group; 26% of the total sample) were randomly selected to be evaluated by an independent researcher not associated with the present study. The independent evaluator confirmed all final diagnoses and subsequent assignment to either the social phobia or nonpsychiatric control group in each of these cases, thus resulting in an estimated reliability coefficient of $\kappa = 1$. Individuals in the social phobia group received significantly higher clinical severity ratings (CSRs) in regard to symptoms of social anxiety as compared to the control group [$t(48) = 26.57$, $p < .001$]. Four participants in the control group did not receive a CSR of zero, and a closer inspection of these cases revealed that all of these participants endorsed mild, subthreshold anxiety symptoms specific to public speaking situations. Means, standard deviations, and ranges for each group on these measures are reported in Table 1.

Self-Report Questionnaires

Questionnaire data were examined to determine differences between the two groups in self-reported levels of anxiety. As expected, individuals in the social phobia group reported significantly higher levels of anxiety on the SPAI-23 Social Phobia subscale [$t(48) = 11.199$, $p < .001$] and SPAI-23 Agoraphobia subscale [$t(48) = 6.037$, $p < .001$]. The SPAI-23 Difference Score was also significantly higher for the social phobia group [$t(48) = 8.772$, $p < .001$].

Similarly, individuals in the social phobia group received significantly higher scores on both the STAI-State [$t(48) = 11.446$, $p < .01$] and STAI-Trait [$t(48) = 9.289$, $p < .001$] measures. Means, standard deviations, and ranges for each group on these measures are reported in Table 1.

Cognitive Tasks

All raw test scores from the cognitive tasks were transformed into *z*-scores using the means and standard deviation values from the nonpsychiatric control group as norm scores. The resulting *z*-scores were then averaged to create scores for each of the nine cognitive domains: Verbal Learning, Verbal Delayed Memory, Visual Immediate Memory, Visual Delayed Memory, Visual-Spatial Processing, Verbal Working Memory, Visual Working Memory, Executive Functioning, and Attention. These domain scores were used as dependent variables in a mixed analysis of variance (ANOVA) with group (social phobia, nonpsychiatric controls) serving as the between-subjects variable and cognitive domain serving as the within-subjects factor. This analysis did not reveal a significant group by cognitive domain interaction ($F(8,41) = 1.335$, $p = .254$, $\eta^2 = .207$), nor a significant main effect of group ($F(1,48) = .566$, $p = .456$, $\eta^2 = .012$). The main effect of cognitive domain was the same as the domain by group interaction due to the fact that the control group had a mean *z*-score of zero across all domains.

As this was the first study to examine multiple cognitive domains in a single sample of individuals with social phobia, exploratory univariate analyses were performed to examine group differences for the specific cognitive domains (see Table 3). This revealed significant group differences in only the Visual Working Memory domain [$t(48) = 2.043$, $p = .047$, $d = 0.578$], with the social phobia group scoring significantly lower than the nonpsychiatric control group. This difference did not survive a conservative Bonferroni correction for the multiple

comparisons, however. This group difference was further evaluated by examining each subtest within the Visual Working Memory domain. Significant differences were found for both Spatial Span Total score [$t(48) = 2.043$, $p = .047$, $d = 0.578$] and Spatial Span Backward score [$t(48) = 2.436$, $p = .019$, $d = 0.689$; see Figure 1], but not for Spatial Span Forward score [$t(48) = 0.809$, $p = .423$, $d = 0.229$], with individuals in the social phobia group having lower scores than the nonpsychiatric control group on all measures.

The role of symptom severity in relation to performance on the Spatial Span task was also assessed by using Spatial Span Total score as the dependent variable in a linear regression with group (social phobia, nonpsychiatric controls) and the SPAI-23 Difference score as predictors. This analysis revealed a nonsignificant trend toward a group by SPAI-23 Difference score interaction ($F(1,46) = 3.004$, $p = .090$, $\eta^2 = .061$), so Spatial Span Backward and Spatial Span Forward scores were also examined separately. When a similar analysis was run using Spatial Span Backward score as the dependent variable, the group by SPAI-23 Difference score interaction was not significant ($F(1,46) = 1.120$, $p = .295$, $\eta^2 = .024$). The main effects of both group ($F(1,46) = 2.760$, $p = .130$, $\eta^2 = .057$) and SPAI-23 Difference score ($F(1,46) = 0.243$, $p = .624$, $\eta^2 = .005$) were also not statistically significant. Spatial Span Forward score was also examined separately, and this analysis revealed a significant group by SPAI-23 Difference score interaction ($F(1,46) = 5.057$, $p = .029$, $\eta^2 = .099$; see Figure 2). An examination of simple effects indicated a significant negative correlation between Spatial Span Forward score and SPAI-23 Difference score for the control group only ($r = -.423$, $p = .035$); this pattern was not observed in the social phobia group ($r = .194$, $p = .354$).

Since there was an a priori hypothesis for the groups to differ on the Verbal Learning and Visual-Spatial Processing domains in particular, the subtests of these domains were further

explored. No significant differences between the social phobia group and nonpsychiatric control group emerged on the Word Lists I Recall score [$t(48) = 0.626$, $p = .535$, $d = 0.177$], Block Design score [$t(48) = 0.388$, $p = .699$, $d = 0.110$], or RCFT-Copy score [$t(48) = 0.670$, $p = .947$, $d = 0.019$].

DISCUSSION

The purpose of the current study was to clarify the neurocognitive mechanisms underlying social phobia. Previous research in this area has identified some specific group differences in neurocognitive functioning between individuals diagnosed with social phobia and nonpsychiatric controls, but has failed to administer a comprehensive neuropsychological battery to a social phobia patient group. This has resulted in a piecemeal understanding of the neurocognitive functioning of this population and an incomplete picture of the neuropsychological profile inherent to this group. The present research utilized a broader collection of neuropsychological tests to assess a wide range of functioning in individuals with generalized social phobia. Specifically, the domains of verbal and visual memory (both immediate and delayed), visual-spatial processing, verbal and visual working memory, executive functioning, and attention were examined.

Based on the limited published findings regarding the neuropsychological functioning of social phobia patients, we hypothesized that the social phobia participants would show a statistically significant reduction in performance, compared to nonpsychiatric controls, in the domains of Verbal Learning and Visual-Spatial Processing. This was based on the few areas of overlap and potential agreement in the extant literature, which suggested a greater probability of true differences in performance between social phobia patients and nonpsychiatric controls in these particular cognitive domains. Results obtained from the current sample, however, failed to support both of these hypotheses.

The lack of a deficit in the Verbal Memory domains appears to be in conflict with the previous findings reported by Asmundson et al. (1994) and Airaksinen, Larsson, and Forsell (2005). In the Asmundson et al. (1994) study, the CVLT was administered to individuals with

social phobia. This test is very similar to the WMS-III Word Lists I and II tasks administered in the present study, as both require learning a word list presented over multiple trials and then an immediate, short delay, and long delay recall. Both tasks also include a forced-choice recognition trial. While Asmundson and colleagues (1994) reported deficits specific to the immediate learning of the CVLT word list (i.e., total immediate recall score for trials one through five), these findings were not replicated in the current study when an analogous score was examined (i.e., Word Lists I immediate recall). These discrepant findings may be due to differences between the current sample and that of the Asmundson (1994) study, but may also be attributable in part to a key difference between the word lists used in these two tasks - which is addressed further below.

Airaksinen, Larsson, and Forsell (2005) assessed verbal memory through presentation of a word list consisting of thirty-two neutral words followed by an immediate recall trial. Again, these researchers reported statistically significant deficits in performance for the social phobia group in both the immediate free and cued recall trials. It is important to note here that this task differs from the WMS-III Word Lists tasks because it relies on a single presentation of a longer word list; it is not designed to assess verbal learning across multiple trials. Furthermore, the word lists used in both the Asmundson et al. (1994) and Airaksinen, Larsson, and Forsell (2005) studies contain words that can be grouped into distinct taxonomic categories, and decreased performance in the recall of these lists may be due to a deficit in mnemonic strategy among individuals with social phobia rather than a global decreased ability in immediate verbal memory. The word list used in the WMS-III cannot easily be grouped into taxonomic categories, and it may be the case that immediate free recall of unrelated words is equally difficult for both individuals with social phobia and nonpsychiatric controls. In the present study, each group

recalled roughly sixty-eight percent of the words presented on the immediate free recall trial. Due to the relative paucity of reported findings in verbal memory for individuals with social phobia, further research will be necessary to determine whether such deficits are common correlates of this disorder.

The current study also did not find decreased performance among patients with social phobia in the Visual-Spatial Processing domain. This finding also is inconsistent with previous research. Both Asmundson et al. (1994) and Cohen et al. (1996) reported deficits on WAIS Block Design scores for individuals with social phobia when compared to nonpsychiatric controls, but this finding was not replicated in the present sample when using the same subtest. The effect sizes from the Asmundson et al. (1994) and Cohen et al. (1996) studies were relatively large, with Cohen's *d* effect sizes ranging from 0.8 to 0.9, indicating that the sample size in the current study should have provided adequate power to detect group differences. Hollander et al. (1996) reported decreased performance of patients with social phobia relative to nonpsychiatric controls on a cube drawing test meant to assess neurological soft signs. The cube drawing task is similar to the RCFT-Copy task used in the present research, but again no significant differences in RCFT-Copy performance emerged between individuals with social phobia and the nonpsychiatric control group. It remains unclear why no significant differences between groups were found on tasks within this domain, particularly with regard to the WAIS Block Design subtest. Additional research is necessary to clarify the manner and extent to which visual-spatial processing deficits are related to social phobia.

Significant deficits in performance for the social phobia group were found, however, in the Visual Working Memory domain. Again, interpretation of these findings is tentative at best because these significant group differences did not survive a conservative Bonferroni correction

for multiple comparisons. Individuals with social phobia scored significantly lower than nonpsychiatric controls in the current sample on the WMS-III Spatial Span task, and this decrease in performance was especially pronounced for the Spatial Span Backward task. Performance on the Spatial Span task was further examined in relation to symptom severity. This analysis revealed a nonsignificant trend toward a group by SPAI-23 Difference score interaction on the Spatial Span Total score, so Spatial Span Forward and Backward scores were also examined in relation symptom severity. Interestingly, there was a significant interaction between group and SPAI-23 Difference score on the Spatial Span Forward score. An examination of simple effects revealed a significant negative correlation between Spatial Span Forward score and SPAI-23 Difference score for the control group only, such that increased self-reported social anxiety symptoms were associated with decreased performance on the Spatial Span Forward task. This pattern was not evident with the social phobia group, however. There was no suggestion of a similar interaction between group and Spatial Span Backward score, nor were there significant main effects for SPAI-23 Difference score under this condition. The Spatial Span Forward task is considered a measure of focal visual attention and passive visual memory storage, and it could be that the decreased performance in relation to increased self-reported social anxiety symptoms is present only for mild to moderate levels of social anxiety. Individuals experiencing moderate to severe levels of social anxiety, like those in the social phobia group in the present study, may not exhibit the same effect. These initial findings and interpretations remain speculative, however, due to the lack of statistical significance after multiple-comparisons correction. Further research is needed to disentangle the relationship between level of social anxiety symptoms and performance on similar visual tasks.

The Graver and White (2007) article has been the only previously published study to administer the WMS-III Spatial Span task to a social phobia patient group. These researchers reported that while there were no significant differences between groups in their baseline condition, significant effects emerged when the task was administered under induced stress. Specifically, control subjects improved performance from baseline conditions when they were re-administered the Spatial Span test under the stress-induction condition, whereas individuals with social phobia showed decreased performance relative to themselves in the stress-induction condition versus the baseline condition. This effect could be secondary to differences in baseline levels of arousal between the two groups; the stress condition may have served to raise arousal levels and enhance performance in the control group, whereas raising the already heightened arousal level of the social phobia participants served to decrease performance (i.e., the Yerkes-Dodson effect; see Calabrese, 2008 for review).

The finding of decreased performance within the Visual Working Memory domain for the social phobia group is particularly interesting in light of the previous neuropsychological findings for this population. While there remains some question as to the specific neurocognitive correlates of this disorder, the results from the current study lend tentative support to a small, yet growing body of literature suggesting impaired performances on tasks falling within the broad domain of visual abilities. If a visual working memory deficit actually does exist, this would have a number of implications for individuals with social phobia. If an individual exhibits poor working memory of nonverbal social cues, for example, this could lead to further disruption in social performance and decreased confidence in social situations due in part to an inability to simultaneously process and interpret the many nonverbal cues present in any one social exchange. Furthermore, the accurate assessment of feedback from others across situations would

be greatly complicated by decreased visual working memory abilities as new visual information may not be effectively consolidated and incorporated into an individual's overall perception of social interactions. It could be the case that an intervention which focuses on the development of enhanced visual working memory strategies may serve to disrupt some of these processes, which may then help to lower overall anxiety in these social situations. More research based on these preliminary findings needs to be conducted before any conclusions can be drawn as to whether such an intervention would be an effective component of a larger treatment plan.

The present research has several limitations. First, all ADIS-IV interviews were administered by the primary investigator, who was not blind to the screening process. Although an attempt was made to estimate diagnosis accuracy through use of an independent rater who was blind to the screening process, this procedure was only completed with a subset of the sample and ultimately may have impacted the assignment of participants into their respective groups. Furthermore, the community sample used in the current study may have represented a set of individuals with less severe symptomatology and higher functioning than is typically seen in clinical settings. For example, the ADIS-IV clinical severity ratings (CSRs) in the social phobia group ranged from four to six (M = 4.56), despite the fact that the CSR scale extends to a rating of eight and that a rating four is generally considered the minimum CSR for those meeting full diagnostic criteria. Moreover, the SPAI-23 Difference score in the social phobia group (M = 44.04, SD = 8.64, range = 30-70) reflected both a lower mean and a narrower range when compared with the original SPAI Difference scores of the clinical sample in the normative group for that measure (M = 95.77, SD = 32.55, range = 15-160.67; Roberson-Nay, Strong, Nay, Beidel, & Turner, 2007). This may partially explain why the neuropsychological functioning of the social phobia group was not significantly different from the nonpsychiatric control group on

the majority of the tasks in the present study, but future research examining more severe clinical samples is necessary before drawing any conclusions of this nature. The present research was also limited by the inclusion of only a single task examining the Visual Working Memory domain as well as single tasks assessing the domains of Visual Immediate Memory and Visual Delayed Memory, respectively. Only one other study with a social phobia sample has included a measure of visual working memory (Graver & White, 2007), and no published study to date on this disorder has included a measure of delayed visual memory. Future research should be directed toward a more complete assessment of visual abilities in individuals with social phobia, including multiple measures of visual-spatial processing as well as working, immediate, and delayed visual memory, with the aim of gaining a more thorough understanding of the specific difficulties within the visual domain experienced by this population. Additionally, it will be important to include measures of emotional identification and recognition, as well as broader measures of social cognition, which may be related to cognitive deficits in the visual domain as well as difficulties with social processing among individuals with social phobia. Research can then move toward uncovering how these mechanisms are related to the development and maintenance of the disorder, so that any specific neuropsychological deficits can be targeted directly and potentially be included as a component in the effective treatment and prevention of social phobia.

APPENDIX A: TABLES

Table 1
Demographic and Clinical Characteristics

Measure	**Social Phobia Group (*n* = 25)**	**Nonpsychiatric Control Group (*n* = 25)**
Gender (male)[a]	52%	52%
Age	38.04 (12.85)	38.60 (12.10)
Years of Education	14.40 (1.73)	14.56 (1.71)
Race: Caucasian [a]	68%	68%
Race: Hispanic/Latino [a]	16%	8%
Race: Black/African American [a]	8%	12%
Race: Asian [a]	4%	12%
Race: Multiracial/Other [a]	4%	0%
ADIS-IV: CSR	4.56 (0.65)**; range = 4 – 6	0.20 (0.50)**; range = 0 – 2
SPAI-23: Social Phobia	63.60 (8.54)**; range = 37 – 78	30.56 (12.03)**; range = 16 – 55
SPAI-23: Agoraphobia	19.56 (5.72)**; range = 7 – 30	10.20 (5.24)**; range = 7 – 25
SPAI-23: Difference Score	44.04 (8.64)**; range = 30 – 70	20.36 (10.37)**; range = 9 – 46
STAI: State	49.76 (8.96)**; range = 26 – 64	25.52 (5.64)**; range = 20 – 45
STAI: Trait	57.28 (11.13)**; range = 28 – 72	31.44 (8.35)**; range = 20 – 56

*$p < .05$; **$p < .001$
Values represent means and standard deviations for all variables except for those notated ([a] indicates a percentage)

Table 2

Cognitive Domains and Measures

Verbal Learning Word Lists I
Verbal Delayed Memory Word Lists II
Visual Immediate Memory Family Pictures I
Visual Delayed Memory Family Pictures II
Visual-Spatial Processing Block Design Rey-Osterrieth Complex Figure Task (Copy)
Verbal Working Memory Letter-Number Sequencing
Visual Working Memory Spatial Span
Executive Functioning Trail-Making Test (Trail B) Stroop Task
Attention Digit Span (Forward) Trail-Making Test (Trail A)

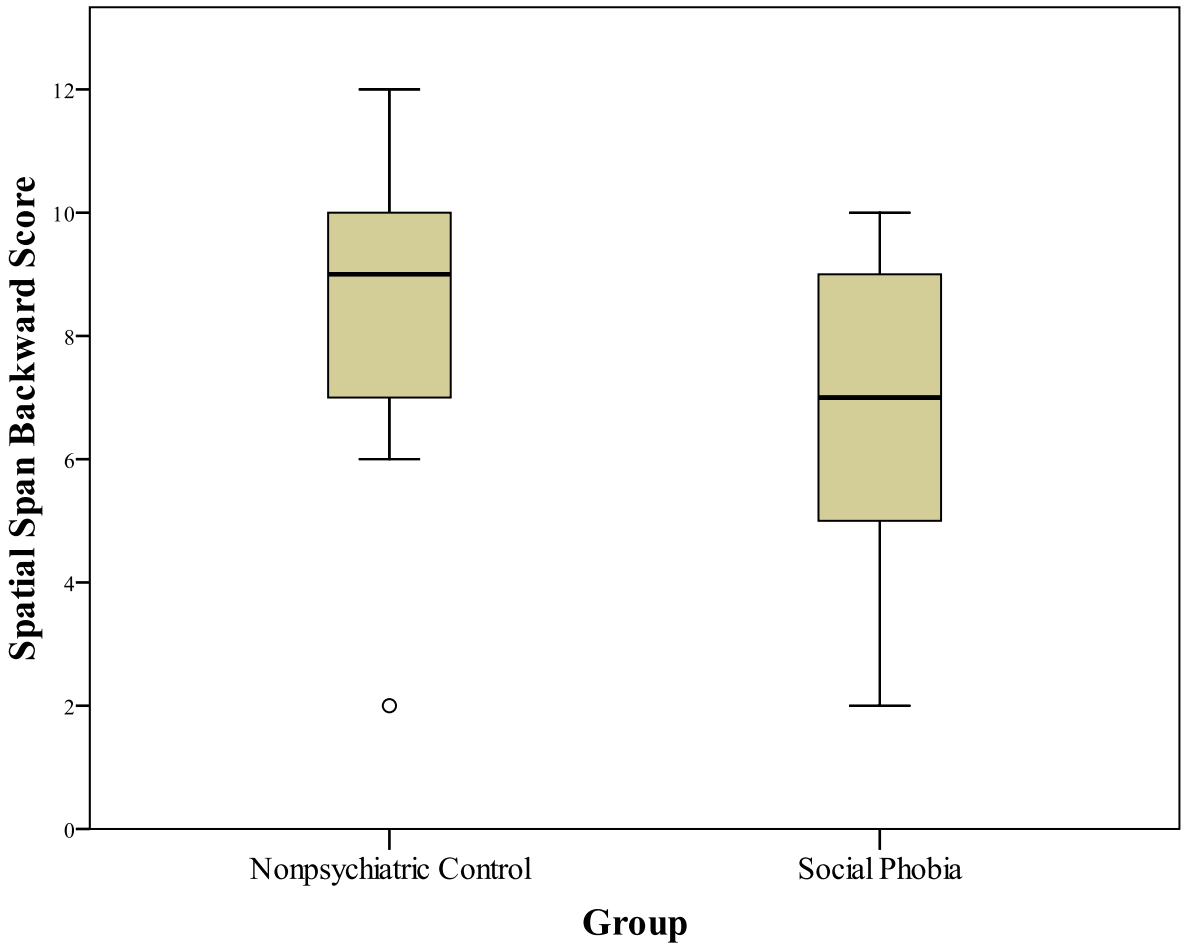
Table 3
Group Differences by Cognitive Domain

Domain	*t* value	df	*p* value	Effect Size (*d*)	Mean *z*-score	Std. Dev.
Verbal Learning	0.626	48	0.535	0.177		
Social Phobia Group					-0.155	0.733
Control Group					0.000	0.999
Verbal Delayed Memory	0.000	48	1.000	<0.001		
Social Phobia Group					0.000	0.983
Control Group					0.000	1.000
Visual Immediate Memory	0.798	48	0.429	0.226		
Social Phobia Group					-0.232	1.052
Control Group					0.000	0.999
Visual Delayed Memory	0.507	48	0.614	0.144		
Social Phobia Group					-0.139	0.934
Control Group					0.000	0.999
Visual-Spatial Processing	0.257	48	0.798	0.072		
Social Phobia Group					0.070	1.075
Control Group					0.000	0.843
Verbal Working Memory	0.582	48	0.563	0.165		
Social Phobia Group					-0.198	1.374
Control Group					0.000	0.999
Visual Working Memory	2.043	48	0.047*	0.578		
Social Phobia Group					-0.506	0.728
Control Group					0.000	1.000
Executive Functioning	1.090	48	0.281	0.308		
Social Phobia Group					0.271	0.931
Control Group					0.000	0.826
Attention	1.033	48	0.307	0.293		
Social Phobia Group					0.171	0.617
Control Group					0.000	0.550

*$p < .05$

APPENDIX B: FIGURES

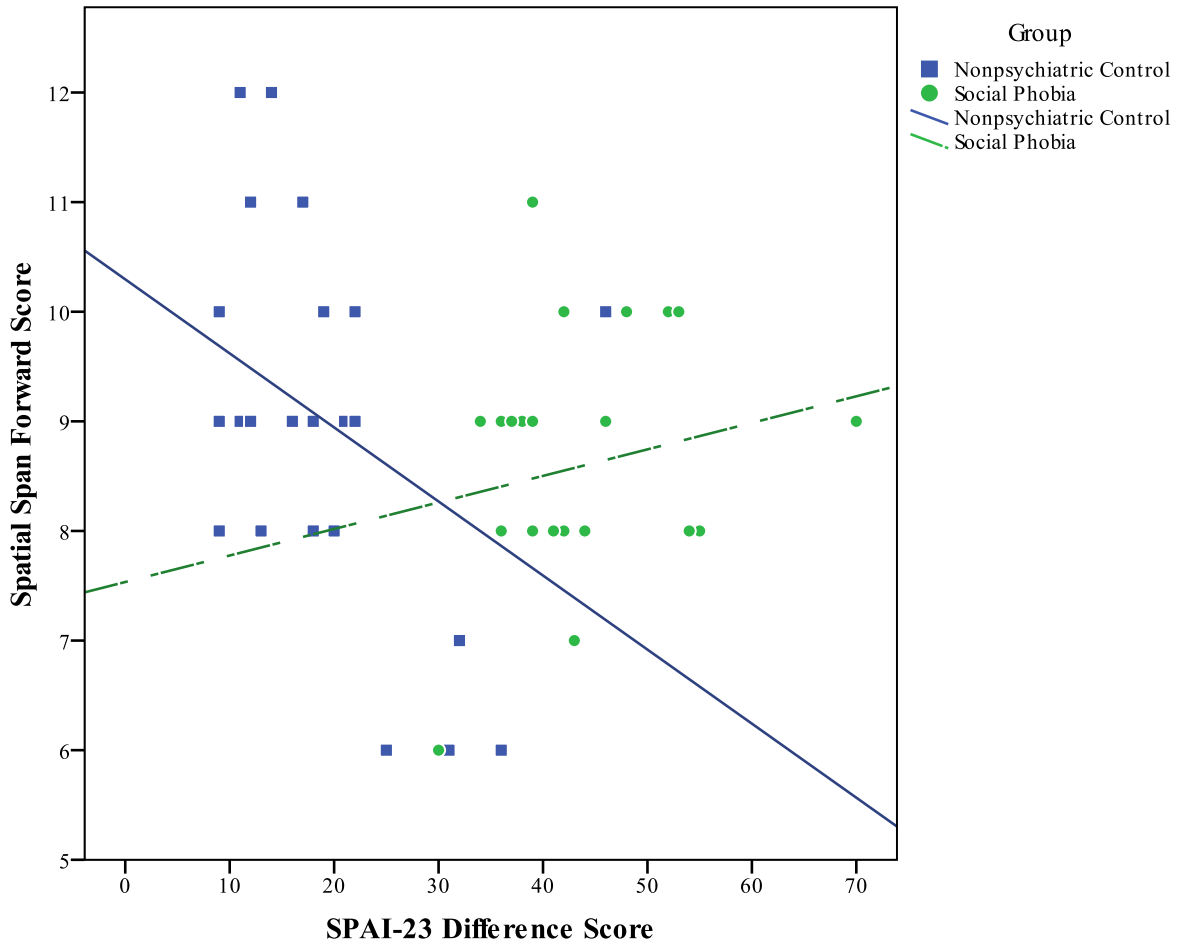
Figure 1
Spatial Span Backward Score by Group



Boxes extend from the 25th percentile to the 75th percentile, with midlines marking the 50th percentile, based on that group's distribution
Bars represent highest and lowest values that fall within 1.5 times the interquartile range
○ indicates an outlier

Figure 2

Group by SPAI-23 Difference Score Interaction on Spatial Span Forward Score



SPAI-23 Difference Score = SPAI-23 Social Phobia subscale – SPAI-23 Agoraphobia subscale

APPENDIX C: IRB APPROVAL LETTER

University of Central Florida Institutional Review Board
Office of Research & Commercialization
12201 Research Parkway, Suite 501
Orlando, Florida 32826-3246
Telephone: 407-823-2901, 407-882-2901 or 407-882-2276
www.research.ucf.edu/compliance/irb.html

Notice of Expedited Initial Review and Approval

From **:** **UCF Institutional Review Board**
FWA00000351, Exp. 5/07/10, IRB00001138

To : **Scott Sutterby**
Date : **June 16, 2008**

IRB Number: **SBE-08-05628**

Study Title: **Neurocognitive Functioning in Social Phobia**

Dear Researcher:

Your research protocol noted above was approved by **expedited** review by the UCF IRB Vice-chair on 6/16/2008. **The expiration date is 6/15/2009.** Your study was determined to be minimal risk for human subjects and expeditable per federal regulations, 45 CFR 46.110. The categories for which this study qualifies as expeditable research are as follows:

> 6. Collection of data from voice, video, digital, or image recordings made for research purposes.
>
> 7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

The IRB has approved a **consent procedure which requires participants to sign consent forms.** Use of the approved, stamped consent document(s) is required. Only approved investigators (or other approved key study personnel) may solicit consent for research participation. Subjects or their representatives must receive a copy of the consent form(s).

All data, which may include signed consent form documents, must be retained in a locked file cabinet for a minimum of three years (six if HIPAA applies) past the completion of this research. Any links to the identification of participants should be maintained on a password-protected computer if electronic information is used. Additional requirements may be imposed by your funding agency, your department, or other entities. Access to data is limited to authorized individuals listed as key study personnel.

To continue this research beyond the expiration date, a Continuing Review Form must be submitted 2 – 4 weeks prior to the expiration date. Advise the IRB if you receive a subpoena for the release of this information, or if a breach of confidentiality occurs. Also report any unanticipated problems or serious adverse events (within 5 working days). Do not make changes to the protocol methodology or consent form before obtaining IRB approval. Changes can be submitted for IRB review using the Addendum/Modification Request Form. An Addendum/Modification

Request Form **cannot** be used to extend the approval period of a study. All forms may be completed and submitted online at http://iris.research.ucf.edu.
Failure to provide a continuing review report could lead to study suspension, a loss of funding and/or publication possibilities, or reporting of noncompliance to sponsors or funding agencies. The IRB maintains the authority under 45 CFR 46.110(e) to observe or have a third party observe the consent process and the research.

On behalf of Tracy Dietz, Ph.D., UCF IRB Chair, this letter is signed by:

Signature applied by Joanne Muratori on 06/16/2008 02:18:13 PM EDT

IRB Coordinator

APPENDIX D: PHONE SCREEN

Phone Screen for Social Phobia Study

Full name of Potential Participant: _____

Phone Number: _____

Interviewer Name: _____

Date of Phone Screen: _____

"Hi. My name is _____ and I'm calling from the Psychology Department at the University of Central Florida in response to the phone message that you left, indicating interest in our research study. May I ask how you learned about our study?" (USE ANSWER TO DETERMINE WHETHER CONTROL OR SOCIAL PHOBIA GROUP)

"Before I explain the study, we need to determine whether you are eligible for this particular study. What is your current age?" _____ (note: exclude if under 18 or over 65).

Social Phobia Screen:

- "In social situations where you might be observed or evaluated by others or when you are meeting new people, do you feel fearful, anxious, or nervous?"

- "Are you overly concerned that you may do and/or say something that might embarrass or humiliate yourself in front of others, or that others may think badly of you?"

If "YES" to either, consider for Social Phobia group – If "NO," consider for Control group

"To see if you are eligible, I will list a series of statements and, at the end of the list, you will say "yes" or "no" to indicate whether you would answer at least one of the items from the list as being true for you. In this way, we will not know which items from the list are true for you, in order to protect your confidentiality. Please think about each item after I read it, but only answer "yes" or "no" after I've read all items. Please answer "no" unless you are fairly sure that an item applies to you. Do you have any questions or concerns about this before I begin the list?"

Exclusion List (Only get a "yes" or "no" at the very end of each list – NOT after each item):

- "At some point in my life, I got hit in the head so hard that I blacked out for more than 10 minutes."

- "I've experienced one or more seizures after the age of 5."

- "I've been diagnosed with a stroke, brain tumor, or other serious neurological disorder - like Parkinson's disease."

- "In the past month, I have used alcohol or drugs to the point that it affected my functioning at school, work, or personal relationships."

- "During at least one point in my life, I received inpatient hospitalization for alcohol or drug dependence."

"Without telling me which item, would you have answered "yes" to at least one item I just listed?" YES / NO (IF YES, skip to below)

"Now we will do the same thing with another list of items. Please remember to wait until the end of the list to indicate whether at least one of them applies to you."

- "I currently have significant problems with my vision, even when wearing glasses or contacts."

- "I have significant difficulty with moving or feeling the arm or hand that I use for writing."

- "I have received electroconvulsive therapy in the past six months."

"Without telling me which item, would you have answered "yes" to at least one item I just listed?" YES / NO (IF YES, skip to below)

"Now we will do the same thing with one last set of items. Please remember to wait until the end of the list to indicate whether at least one of them applies to you."

- "I have been diagnosed with AIDS, Lupus, congestive heart disease, or insulin-dependent diabetes."

- "I have been diagnosed with dyslexia or another specific learning disability."

- "English is not the first language that I spoke as a child."

"Without telling me which item, would you have answered "yes" to at least one item I just listed?" YES / NO (IF YES, skip to below)

If "YES" to any list above – "Thank you for your openness with this procedure. Unfortunately, you do not qualify for this particular study because you endorsed at least one of these factors which could influence your performance on the tasks in our study. We appreciate your time completing this brief phone screen. Do you have any questions I can address?"

IF "NO" – "Thanks for going through this list with me. It sounds like you qualify for participation in our study. Can I give you a brief overview of what the study involves, so that you can decide if you'd like to participate?"

If Control Group:
“We are conducting a study to examine differences in thinking ability and perception as it relates to social anxiety. We are interested in having you participate in a community comparison group so that we can look at differences in your performance with the performance of individuals who experience intense anxiety or fear in social situations. We hope to gain information that may lead to better treatment for social anxiety.”

If Social Phobia Group:
“We are conducting a study to examine differences in thinking ability and perception as it relates to social anxiety. We are interested in having you participate in the group of individuals who experience anxiety in social situations. We hope to gain information that may one day lead to better treatment for social anxiety.”

All Groups:
"The study will take place in our research laboratory in the Psychology Building on the main campus of the University of Central Florida in east Orlando. You will be provided with detailed directions and free parking in front of the building. During this meeting, we will interview you about your mental and physical health and you will be asked to complete some questionnaires about psychological experiences you may have had. After this interview, we will ask you to complete a series of thinking ability and perception tasks. All information you provide will remain strictly confidential. Your name will not be used in any report or presentation. This meeting would last about 2.5 hours. You will be paid by check at the end of the meeting at the rate of $10 for each 30 minutes of participation, so you can expect to be paid approximately $50, although the exact time and amount may vary slightly for each participant.

"Are there any questions or concerns about that I can address for you?"

"Are you willing to participate, with the understanding that you can discontinue participation at any point, for any reason, without penalty?"
IF SO – schedule date and time: _____

"I have a map and directions to send you to help you find our building. Would you prefer that I e-mail, fax, or mail these to you?" (INCLUDE INFORMATION BELOW) - Send our cover letter with appointment date and time, along with map/directions.

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